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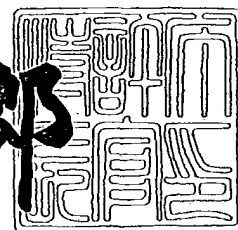
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What is claimed is:

1 1. A compiler apparatus for generating an instruction code
2 composed of instruction sets each including an instruction that
3 designates an m -bit immediate value indicating a location of
4 a data item in a memory area, comprising:

5 an allocation data selecting unit operable to sequentially
6 select a data item from a group X composed of a plurality of
7 data items each having a plurality of data attributes, the
8 selection being made based on a first criterion relating to one
9 of the data attributes;

10 an allocation judging unit operable to judge, each time
11 a data item is selected, whether the selected data item is
12 allocatable to an n -byte memory area, where $n \leq 2^m$; and

13 an exclusion data specifying unit operable to specify,
14 when the judgment is negative, a data item to be excluded from
15 the group X out of all data items having been selected, the
16 specification being made based on a second criterion relating
17 to a different one of the data attributes, wherein

18 the allocation data selecting unit repeats the selection
19 from data items that remain in the group X after excluding all
20 data items having been specified to be excluded, until all the
21 remaining data items are judged to be allocatable to the memory
22 area.

1 2. The compiler apparatus according to Claim 1, wherein

2 the first criterion is a descending order of an alignment

3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area,

6 the allocation data selecting unit selects a data item
7 in the descending order of an alignment of each data item,

8 the second criterion is a descending order of a size of
9 each data item, and

10 the exclusion data specifying unit specifies a data item
11 in the descending order of a size of each data item.

1 3. The compiler apparatus according to Claim 2, further comprises

2 a re-allocation data selecting unit operable to
3 sequentially select, after the allocation data selecting unit
4 completes the selection, a data item from the excluded data items,
5 the selection by the re-allocation data selecting unit being
6 made in an ascending order of a size of each data item, wherein

7 the allocation judging unit further judges, each time a
8 data item is selected by the re-allocation data selecting unit,
9 the selected data item is allocatable to the memory area.

1 4. The compiler apparatus according to Claim 1, wherein

2 the allocation data selecting unit further sequentially
3 selects, after completing the selection, a data item from the
4 excluded data items, the further-selection being made based on
5 the first criterion,

6 the allocation judging unit further judges, each time a
7 data item is further-selected, whether the further-selected data

8 item is allocatable to another memory area,
9 the exclusion data specifying unit further specifies, when
10 the further judgment is negative, a data item to be re-excluded
11 from the excluded data items out of all data items having been
12 further-selected, the further specification being made based
13 on the second criterion, and
14 the allocation data selecting unit repeats the
15 further-selection from data items that remain after excluding
16 all data items having been further specified to be re-excluded,
17 until all the remaining data items are judged to be allocatable
18 to said another memory area, and
19 when there are any re-excluded data items after completing
20 the further-selection,
21 the allocation data selecting unit further selects a data
22 item sequentially from the re-excluded data items,
23 the allocation judging unit further judges, each time a
24 data item is further selected from the re-excluded data items,
25 whether the further-selected data item is allocatable to a yet
26 another memory area, and
27 the exclusion data specifying unit further specifies a
28 data item when the further judgment is negative.

1 5. The compiler apparatus according to Claim 4, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area, and

6 the second criterion is a descending order of a size of
7 each data item.

1 6. The compiler apparatus according to Claim 4, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area, and
6 the second criterion is an ascending order of a reference
7 frequency of each data item, the reference frequency representing
8 how frequently a corresponding data item is referenced.

1 7. The compiler apparatus according to Claim 1, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area,
6 the allocation data selecting unit selects a data item
7 in the descending order of an alignment of each data item,
8 the second criterion is an ascending order a reference
9 frequency of each data item, the reference frequency representing
10 how frequently a corresponding data item is referenced, and
11 the exclusion data specifying unit specifies a data item
12 in the ascending order of a reference frequency of each data
13 item.

1 8. The compiler apparatus according to Claim 7, further

2 comprising

3 a re-allocation data selecting unit operable to
4 sequentially select, after the allocation data selecting unit
5 completes the selection, a data item from the excluded data items,
6 the selection by the re-allocation data selecting unit being
7 made in a descending order of a reference frequency of each data
8 item, wherein

9 the allocation judging unit further judges, each time a
10 data item is selected by the re-allocation data selecting unit,
11 whether the selected data item is allocatable to the memory area.

1 9. A data location determining method for a compiler apparatus
2 to generate an instruction code composed of instruction sets
3 each including an instruction that designates an m -bit immediate
4 value indicating a location of a data item in a memory area,
5 the method comprising:

6 an allocation data selecting step of sequentially
7 selecting a data item from a group X composed of a plurality
8 of data items each having a plurality of data attributes, the
9 selection being made based on a first criterion relating to one
10 of the data attributes;

11 an allocation judging step of judging, each time a data
12 item is selected, whether the selected data item is allocatable
13 to an n -byte memory area, where $n \leq 2^m$; and

14 an exclusion data specifying step of specifying, when the
15 judgment is negative, a data item to be excluded from the group
16 X out of all data items having been selected, the specification

17 being made based on a second criterion relating to a different
18 one of the data attributes, wherein
19 the allocation data selecting step repeats the selection
20 from data items that remain in the group X after excluding all
21 data items having been specified to be excluded, until all the
22 remaining data items are judged to be allocatable to the memory
23 area.

1 10. The data location determining method according to Claim 9,
2 wherein
3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area,
7 the allocation data selecting step selects a data item
8 in the descending order of an alignment of each data item,
9 the second criterion is a descending order of a size of
10 each data item, and
11 the exclusion data specifying step specifies a data item
12 in the descending order of a size of each data item.

1 11. The data location determining method according to Claim 9,
2 wherein
3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area,

7 the allocation data selecting step selects a data item
8 in the descending order of an alignment of each data item,
9 the second criterion is an ascending order a reference
10 frequency of each data item, the reference frequency representing
11 how frequently a corresponding data item is referenced, and
12 the exclusion data specifying step specifies a data item
13 in the ascending order of a reference frequency of each data
14 item.

1 12. The data location determining method according to Claim 9,
2 wherein

3 the allocation data selecting step further sequentially
4 selects, after completing the selection, a data item from the
5 excluded data items, the further-selection being made based on
6 the first criterion,

7 the allocation judging step further judges, each time a
8 data item is further-selected, whether the further-selected data
9 item is allocatable to another memory area,

10 the exclusion data specifying step further specifies, when
11 the further judgment is negative, a data item to be re-excluded
12 from the excluded data items out of all data items having been
13 further-selected, the further specification being made based
14 on the second criterion, and

15 the allocation data selecting step repeats the
16 further-selection from data items that remain after excluding
17 all data items having been further specified to be re-excluded,
18 until all the remaining data items are judged to be allocatable

19 to said another memory area, and
20 when there are any re-excluded data items after completing
21 the further-selection,
22 the allocation data selecting step further selects a data
23 item sequentially from the re-excluded data items,
24 the allocation judging step further judges, each time a
25 data item is further selected from the re-excluded data items,
26 whether the further-selected data item is allocatable to a yet
27 another memory area, and
28 the exclusion data specifying step further specifies a
29 data item when the further judgment is negative.

1 13. The data location determining method according to Claim 12,
2 wherein
3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area, and
7 the second criterion is a descending order of a size of
8 each data item.

1 14. The data location determining method according to Claim 12,
2 wherein
3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area, and

7 the second criterion is an ascending order of a reference
8 frequency of each data item, the reference frequency representing
9 how frequently a corresponding data item is referenced.

1 15. A program for a compiler apparatus to generate an instruction
2 code composed of instruction sets each including an instruction
3 that designates an m -bit immediate value indicating a location
4 of a data item in a memory area, the program comprising:

5 an allocation data selecting step of sequentially
6 selecting a data item from a group X composed of a plurality
7 of data items each having a plurality of data attributes, the
8 selection being made based on a first criterion relating to one
9 of the data attributes;

10 an allocation judging step of judging, each time a data
11 item is selected, whether the selected data item is allocatable
12 to an n -byte memory area, where $n \leq 2^m$; and

13 an exclusion data specifying step of specifying, when the
14 judgment is negative, a data item to be excluded from the group
15 X out of all data items having been selected, the specification
16 being made based on a second criterion relating to a different
17 one of the data attributes, wherein

18 the allocation data selecting step repeats the selection
19 from data items that remain in the group X after excluding all
20 data items having been specified to be excluded, until all the
21 remaining data items are judged to be allocatable to the memory
22 area.

1 16. The program according to Claim 15, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area,
6 the allocation data selecting step selects a data item
7 in the descending order of an alignment of each data item,
8 the second criterion is a descending order of a size of
9 each data item, and
10 the exclusion data specifying step specifies a data item
11 in the descending order of a size of each data item.

1 17. The program according to Claim 15, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area,
6 the allocation data selecting step selects a data item
7 in the descending order of an alignment of each data item,
8 the second criterion is an ascending order a reference
9 frequency of each data item, the reference frequency representing
10 how frequently a corresponding data item is referenced, and
11 the exclusion data specifying step specifies a data item
12 in the ascending order of a reference frequency of each data
13 item.

1 18. The program according to Claim 15, wherein

2 the allocation data selecting step further sequentially
3 selects, after completing the selection, a data item from the
4 excluded data items, the further-selection being made based on
5 the first criterion,

6 the allocation judging step further judges, each time a
7 data item is further-selected, whether the further-selected data
8 item is allocatable to another memory area,

9 the exclusion data specifying step further specifies, when
10 the further judgment is negative, a data item to be re-excluded
11 from the excluded data items out of all data items having been
12 further-selected, the further specification being made based
13 on the second criterion, and

14 the allocation data selecting step repeats the
15 further-selection from data items that remain after excluding
16 all data items having been further specified to be re-excluded,
17 until all the remaining data items are judged to be allocatable
18 to said another memory area, and

19 when there are any re-excluded data items after completing
20 the further-selection,

21 the allocation data selecting step further selects a data
22 item sequentially from the re-excluded data items,

23 the allocation judging step further judges, each time a
24 data item is further selected from the re-excluded data items,
25 whether the further-selected data item is allocatable to a yet
26 another memory area, and

27 the exclusion data specifying step further specifies a
28 data item when the further judgment is negative.

1 19. The program according to Claim 18, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area, and
6 the second criterion is a descending order of a size of
7 each data item.

1 20. The program according to Claim 18, wherein
2 the first criterion is a descending order of an alignment
3 of each data item, the alignment being a value representing a
4 strength of a constraint on an allocatable location of a
5 corresponding data item in a memory area, and
6 the second criterion is an ascending order of a reference
7 frequency of each data item, the reference frequency representing
8 how frequently a corresponding data item is referenced.

1 21. A computer-readable recording medium storing thereon a
2 program for a compiler apparatus to generate an instruction code
3 composed of instruction sets each including an instruction that
4 designates an *m*-bit immediate value indicating a location of
5 a data item in a memory area, the program comprising:
6 an allocation data selecting step of sequentially
7 selecting a data item from a group X composed of a plurality
8 of data items each having a plurality of data attributes, the
9 selection being made based on a first criterion relating to one
10 of the data attributes;

11 an allocation judging step of judging, each time a data
12 item is selected, whether the selected data item is allocatable
13 to an n -byte memory area, where $n \leq 2^m$; and
14 an exclusion data specifying step of specifying, when the
15 judgment is negative, a data item to be excluded from the group
16 X out of all data items having been selected, the specification
17 being made based on a second criterion relating to a different
18 one of the data attributes, wherein
19 the allocation data selecting step repeats the selection
20 from data items that remain in the group X after excluding all
21 data items having been specified to be excluded, until all the
22 remaining data items are judged to be allocatable to the memory
23 area.

1 22. The computer-readable recording medium according to Claim
2 21, wherein

3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area,

7 the allocation data selecting step selects a data item
8 in the descending order of an alignment of each data item,

9 the second criterion is a descending order of a size of
10 each data item, and

11 the exclusion data specifying step specifies a data item
12 in the descending order of a size of each data item.

1 23. The computer-readable recording medium according to Claim
2 21, wherein

3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area,

7 the allocation data selecting step selects a data item
8 in the descending order of an alignment of each data item,

9 the second criterion is an ascending order a reference
10 frequency of each data item, the reference frequency representing
11 how frequently a corresponding data item is referenced, and

12 the exclusion data specifying step specifies a data item
13 in the ascending order of a reference frequency of each data
14 item.

1 24. The computer-readable recording medium according to Claim
2 21, wherein

3 the allocation data selecting step further sequentially
4 selects, after completing the selection, a data item from the
5 excluded data items, the further-selection being made based on
6 the first criterion,

7 the allocation judging step further judges, each time a
8 data item is further-selected, whether the further-selected data
9 item is allocatable to another memory area,

10 the exclusion data specifying step further specifies, when
11 the further judgment is negative, a data item to be re-excluded
12 from the excluded data items out of all data items having been

13 further-selected, the further specification being made based
14 on the second criterion, and

15 the allocation data selecting step repeats the
16 further-selection from data items that remain after excluding
17 all data items having been further specified to be re-excluded,
18 until all the remaining data items are judged to be allocatable
19 to said another memory area, and

20 when there are any re-excluded data items after completing
21 the further-selection,

22 the allocation data selecting step further selects a data
23 item sequentially from the re-excluded data items,

24 the allocation judging step further judges, each time a
25 data item is further selected from the re-excluded data items,
26 whether the further-selected data item is allocatable to a yet
27 another memory area, and

28 the exclusion data specifying step further specifies a
29 data item when the further judgment is negative.

1 25. The computer-readable recording medium according to Claim
2 24, wherein

3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area, and

7 the second criterion is a descending order of a size of
8 each data item.

1 26. The computer-readable recording medium according to Claim
2 24, wherein

3 the first criterion is a descending order of an alignment
4 of each data item, the alignment being a value representing a
5 strength of a constraint on an allocatable location of a
6 corresponding data item in a memory area, and

7 the second criterion is an ascending order of a reference
8 frequency of each data item, the reference frequency representing
9 how frequently a corresponding data item is referenced.